100-282 1976

1433112 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

FIG. 1

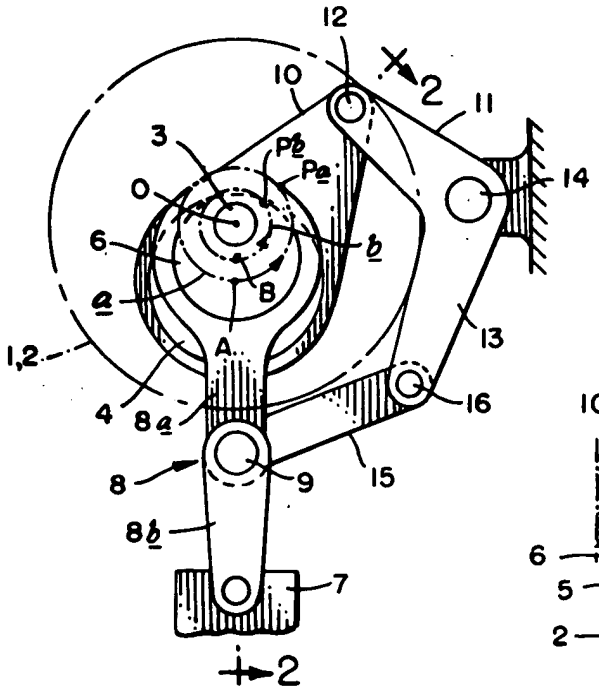


FIG. 2

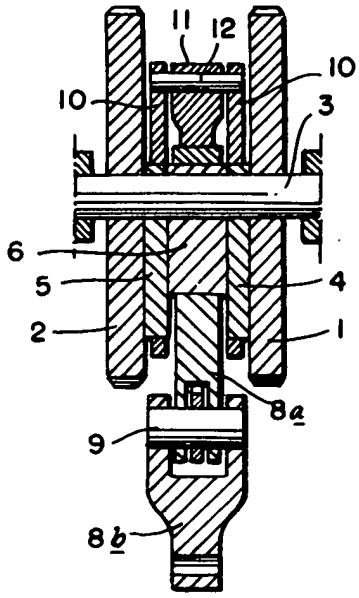
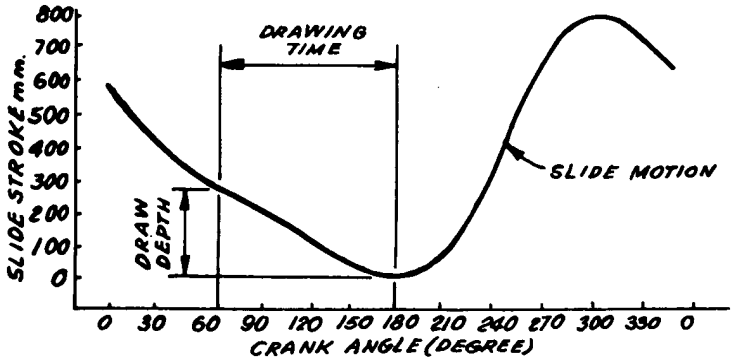


FIG. 3



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(19)

(54) DRIVING LINKAGES FOR RECIPROCATING THE SLIDES OF MECHANICAL PRESSES

(71) We, U.S. INDUSTRIES INC, a Corporation organised and existing under the laws of the State of Delaware, United States of America, of 250 Park Avenue, New York, State of New York, United States of America and HITACHI SHIPBUILDING AND ENGINEERING CO. LTD a Japanese Body Corporate of No. 47 1—chome, Edobori, Nishi-ku, Osaka, Japan do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a driving linkage for reciprocating the slide of mechanical press.

The invention provides a driving linkage for reciprocating the slide of mechanical press having a frame, comprising a driving shaft, two driving gears mounted in spaced apart relation on said shaft, a first eccentric on said shaft between said driving gears, a connecting rod between said first eccentric and the slide, whereby rotation of said first eccentric will reciprocate the slide, said rod having two parts, one part of said rod being connected to said first eccentric, the other part of said rod being connected to the slide, and the two parts of said rod are pivotally connected together to form a joint, second and third eccentrics on said shaft each one being positioned between said first eccentric and one of said driving gears, a pair of first links each connected at one end thereof to one of said second and third eccentrics, another link connected at one end to said joint, and a bell crank lever pivotally mounted on said frame, one of the arms of said lever being connected to said pair of first links, and the other arm of said lever being connected to said other link, whereby rotation of said second and third eccentrics will impart a lateral movement to said joint, thereby to impart to said slide a reciprocating movement which is relatively slow as it approaches lower dead centre and relatively fast as it returns to top dead centre.

The following is a description of one embodiment of the invention, reference being made to the accompanying drawings in which:

Figure 1 is a front elevational schematic view, showing a linkage arrangement for reciprocating a slide,

Figure 2 is a sectional view taken along the plane of line 2—2 of Figure 1, and

Figure 3 is a motion curve, illustrating the movement cycle of the slide.

Referring to the drawing, and especially to Figures 1 and 2, there are provided two driving gears 1 and 2, mounted in spaced apart relation on a rotating shaft 3. The inner face of the driving gear 1 is provided with an eccentric 4 either secured thereto or formed integrally therewith. The inner face of the other driving gear 2 is also provided with an identical eccentric 5.

An eccentric ring 6 is also mounted on the shaft 3 between the two eccentrics 4 and 5. It should be noted that the ring 6 has a slightly less eccentricity than the eccentrics 4 and 5. All of these eccentrics are rotatable together with the driving gears 1 and 2.

The numeral 7 represents the slide of a metal drawing press, and 8 represents, generally, the connecting rod which is formed of the upper part 8*a* and a lower part 8*b*. The adjacent ends of these two parts are connected together by a pin 9, thereby forming a joint capable of being moved in a lateral direction, as well as reciprocating up and down.

A pair of first links 10 has one end thereof extending around the eccentrics 4 and 5, which have the larger eccentricity. The upper end of this pair of links 10 is connected to one arm 11 of a bell crank lever by means of the pivot pin 12. The other arm of the bell crank lever is indicated at 13, and this lever is pivotally mounted at 14 on the frame of the machine.

A second link 15 is connected at one end

thereof to the joint at the pin 9 and at its other end to the arm 13 of the bell crank lever by means of the pivot pin 16.

The upper end of the part 8*a* of the connecting rod receives the eccentric ring 6, having the smaller eccentricity. It will be evident at this point that Figures 1 and 2 illustrate the various parts of the linkage assembly wherein the slide 7 is in its lowermost position. It will also be evident that rotation of the cranks or eccentrics will not only cause a reciprocation of the joint 9 and slide 7 in a vertical direction, but, also, will impress upon this movement a lateral motion to the joint 9. In this manner, the variation in the speed of movement of the slide is obtained.

In Figure, 1 the center of the rotary shaft 3 is indicated at 0. The point A indicates the center of the eccentric rings 4 and 5, and B indicates the center of the eccentric 6.

When the driving gears 1 and 2 are rotated in a counter-clockwise direction, as shown by the arrows in Figure 1, the center A of the eccentric rings 4 and 5 will move on a circular locus *a*, around the center O of the rotary shaft 3. This motion will cause the link 10 to move upwardly and toward the right, thereby rotating the bell crank lever about its pivot 14 in a clockwise direction. This will impart a lateral movement to the pin 9 by reason of its connection with the bell crank lever by means of the second link 15.

At the same time, the center B of the other eccentric ring 6 is revolving on a circular locus *b*. It is evident that the diameter of the circular path *b* is less than the diameter of the circular path *a*. This movement will impart an up and down motion to the upper part 8*a* of the connecting rod, which carries with it the pin 9, the lower part 8*b* and the slide 7.

This combination of movements up and down and laterally of the joint 9 will transmit to the slide a very rapid upward movement from the lowermost position thereof to its uppermost position, as may be evidenced by the right-hand portion of the motion curve in Figure 3. This uppermost position of the slide will be reached upon a rotation of the shaft 3 and the eccentrics through approximately 130° wherein the centers A and B of the two eccentrics will have reached the positions indicated at P*a* and P*b*. Continued rotation of the parts through about 230° will bring the slide downwardly back to its lowermost position. According to the motion curve of Figure 3, the downward stroke of the slide consumes more time, and, therefore, it will descend slowly, but will move upwardly very rapidly. Also, since the eccentricity of the two eccentrics is different, the speed of the slide in its up and down movement will be variable.

Referring to Figure 3, it will become apparent that the slide 7 is lowered with a relatively rapid rate of speed at the beginning of the downward stroke, and will then decelerate so that during the drawing time, the slide moves rather slowly.

As mentioned above, the eccentric rings 4 and 5 on the one hand, and 6 on the other, are all mounted on one shaft but have different eccentricities. The up and down movement of the slide, provided by the eccentric ring 6 is combined with the lateral movement of the joint provided by the eccentric rings 4 and 5, and both movements are combined into a single composite, whereupon the slide will have a variable speed movement.

It will be understood that in the above described device, the initial part of the downward stroke, as well as the return stroke, can be accelerated to a greater degree than has heretofore been possible, and the working stroke can be decelerated to a considerable extent. As a result, it is possible to shorten the time required for one cycle of the slide, thereby producing improved efficiency, and still allow the drawing to be carried out at a slow rate of speed. This, then, results in avoiding the formation of creases and fractures in the workpiece.

WHAT WE CLAIM IS:—

1. A driving linkage for reciprocating the slide of mechanical press having a frame, comprising a driving shaft, two driving gears mounted in spaced apart relation on said shaft, a first eccentric on said shaft between said driving gears, a connecting rod between said first eccentric and the slide, whereby rotation of said first eccentric will reciprocate the slide, said rod having two parts, one part of said rod being connected to said first eccentric, the other part of said rod being connected to the slide, and the two parts of said rod are pivotally connected together to form a joint, second and third eccentrics on said shaft each one being positioned between said first eccentric and one of said driving gears, a pair of first links each connected at one end thereof the one of said second and third eccentrics, another link connected at one end to said joint, and a bell crank lever pivotally mounted on said frame, one of the arms of said lever being connected to said pair of first links, and the other arm of said lever being connected to said other link, whereby rotation of said second and third eccentrics will impart a lateral movement to said joint, thereby to impart to said slide a reciprocating

movement which is relatively slow as it approaches lower dead centre and relatively fast as it returns to top dead centre.

2. A driving linkage as defined in claim 1, wherein the eccentricities of said second and third eccentrics are greater than the eccentricity of said first eccentric.

3. A driving linkage for reciprocating the slide of a mechanical press substantially as described with reference to and as illustrated in the accompanying drawings.

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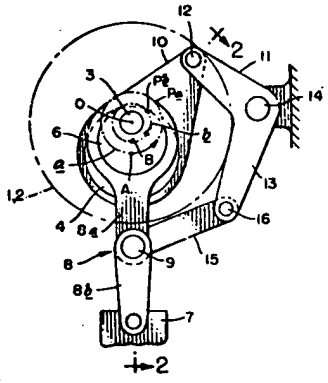
Mechanical press driving linkage - uses three eccentrics and links to give slow feed and fast return movement
US INDUSTRIES INC (HITF) 10.06.74-GB-025676
P71 (22.04.76) B30b-01/14

A driving shaft (3) has a pair of gears (1, 2) spaced on it with an eccentric (4) between them and a connecting rod (8) linking the eccentric and the press slide (7). The connecting rod (8) is in two parts, one (8a) joined to the first eccentric and the other (8b) to the slide, and both parts pivoted together (9). Two further eccentrics (5, 6) are also carried by the drive shaft, and operate a bell crank mechanism (11) joined to an arm (10) of one of the eccentrics and to a pivot pin (15) linked to the pivot joint in the connecting rod halves. The slide is thus given a slow motion towards lower dea centre, and a faster one as it returns to top dead centre.



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